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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/615,042

07/08/2003

Valeriy Sukharev

03-0509

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06/16/2006

LSI LOGIC CORPORATION

1621 BARBER LANE

MS: D-106

MILPITAS, CA 95035

EXAMINER

FENTY, JESSE A

ART UNIT

PAPER NUMBER

2815

DATE MAILED: 06/16/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/615,042	Applicant(s) SUKHAREV ET AL.	
	Examiner Jesse A. Fenty	Art Unit 2815	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 06 April 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-7 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-7 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hsu (U.S. Patent No. 6,334,249 B2) in view of Hsu et al. (U.S. Patent No. 6,143,645).

In re claims 1, 3 and 6, Hsu (esp. Figs. M-2C) disclose a semiconductor device and method of forming the same comprising:

copper deposits (200, column 5, line 35);

an intermediate liner layer (205) comprising tantalum nitride (column 10, line 50);

and

an interconnect liner layer (220) comprising aluminum-copper alloy (column 10, line 34), wherein the interconnect liner layer is a permanent component of the interconnect and does not interact with the copper deposit to form an alloy at any time while the method is performed; and

an upper copper layer (column 5, lines 53-55), wherein the interconnect liner layer is a permanent component of the interconnect and does not interact with the copper or copper deposit to form an alloy at any time while the method is performed (as a result of the presence of the TaN layer as described in Applicant's specification.)

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Hsu ('249) does not expressly disclose the use of CMP, but does disclose the upper layer having a degree of planarity (column 5, lines 18-19). Hsu ('645) discloses the use of CMP for damascene devices such as this (column 6, lines 8-10). CMP is also well-known method of forming planar layers in the art and it would have been obvious for one skilled in the art at the time of the invention to use such a process, for the purpose, for example, of producing more uniform devices.

Hsu ('249) does not expressly disclose the formation of a trench structure in combination with a via structure, but does disclose the use of the invention in a damascene structure (column 8, lines 50-51). Hsu ('645) further describes the damascene processing structure as comprising a trench (upper) portion as well as a via (lower) portion (column 5, lines 61-67), where "deeper holes" (vias) are formed. Damascene processes that produce these trench and via structures are also well known in the art. Therefore, though not expressly disclosed by Hsu ('249), it would have been obvious for one skilled in the art at the time of the invention to form the interconnect liner layer along a trench and via sidewalls, because such a structure is a product of damascene interconnect technology and such is disclosed by the prior art of record.

In re claim 2, 4, and 7, Hsu in view of Hsu discloses the methods and device of claims 1, 3, and 6 respectively, wherein the deposition method is PVD (column 6, lines 22-37).

Additionally, such a technique is disclosed by Applicant in the specification to be a "conventional" technique and thus would have been obvious for one of ordinary skill the art at the time of the invention to employ to fabricate the structure.

In re claim 5, Hsu in view of Hsu discloses the method of claim 3, wherein the intermediate liner layer comprises Ta/TaN.

Response to Arguments

Applicant's arguments filed 04/06/06 have been fully considered but they are not persuasive.

Applicant's amendments to the claims and remarks directed to are not persuasive in view of the disclosure of Hsu ('249) as further expounded by Hsu ('645) to address the additions to the claims brought in by applicant's amendments.

Initially, the arguments addressed to the disclosure of Farrar are not addressed because applicant has successfully amended the claims to take the Farrar disclosure out of consideration.

Therefore, addressing the arguments cited concerning the Hsu ('249) reference, applicant plainly argues that Hsu ('249) does not disclose depositing the aluminum-copper alloy along the sides of a trench and a via. This argument is addressed in the new rejection above, such that the disclosure of Hsu ('249) teaches a damascene interconnect. The secondary reference, Hsu ('645) is included to show that a damascene interconnect is well known to have a trench region as well as a via region.

Second, applicant's comments with regard to the lack of teaching of polishing the copper deposit is not persuasive. Examiner positively addressed claim 6 in the previous rejection regarding the disclosure of Hsu ('249) regarding the desirability of planar

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layers. In this present rejection, the secondary reference of Hsu ('645) is also consulted to show the desirability of planar layers through the process known as CMP.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

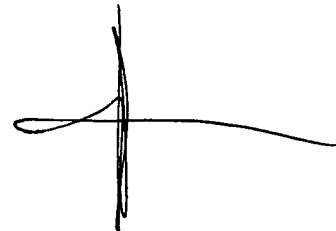
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jesse A. Fenty whose telephone number is 571-272-1729. The examiner can normally be reached on M-F 5/4.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ken Parker can be reached on 571-272-2298. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

JAF

A handwritten signature in black ink, consisting of a vertical line with a horizontal stroke crossing it, and a long horizontal line extending to the right.

KENNETH PARKER
SUPERVISORY PATENT EXAMINER